

WHAT IS CLAIMED IS:

1 1. A method for providing self-interference cancellation in two-way
2 relayed electromagnetic communication between a first device and a second device through a
3 relay station comprising the steps of:

4 generating at said first device a modulated near signal;
5 transmitting said modulated near signal from said first device to said relay
6 station;

7 receiving at said first device a composite signal from said relay station, said
8 composite signal containing a relayed version of said modulated near signal and a relayed
9 version of a modulated far signal transmitted from said second device;

10 providing said composite signal in a representation as a first interface signal to
11 a canceler module of said first device;

12 providing a representation of said modulated near signal as a second interface
13 signal to said canceler module, said second interface signal being of a frequency centered at
14 or near a second interface frequency not at baseband;

15 canceling at said canceler module a portion of said relayed version of said
16 modulated near signal from said representation of said composite signal using said second
17 interface signal to produce a cancellation-processed signal; and

18 outputting said cancellation-processed signal as a third interface signal from
19 said canceler module.

1 2. The method of claim 1 wherein said first interface signal is of a
2 frequency centered at or near a first interface frequency not at baseband.

1 3. The method of claim 2 wherein said first interface frequency is an
2 Intermediate Frequency (IF) or a Radio Frequency (RF) frequency.

1 4. The method of claim 1 wherein said second interface signal is an IF or
2 RF frequency.

1 5. The method of claim 1 wherein said third interface signal is of a
2 frequency centered at or near a third interface frequency not at baseband.

1 6. The method of claim 5 wherein said third interface frequency is an IF
2 or RF frequency.

- 1 7. The method according to claim 1 wherein said first, second and third
2 interface signals are provided or outputted at readily accessible locations.
- 1 8. The method according to claim 1 wherein said second interface signal
2 is provided from a point in its signal path immediately preceding a signal emission stage.
- 1 9. The method according to claim 1 wherein said canceling step includes:
2 applying a time delay and phase rotation to a representation of said second
3 interface signal to obtain a time-delayed and phase-rotated local near signal;
4 correlating said time-delayed and phase-rotated local near signal with at least a
5 representation of said first interface signal to obtain correction signals for said time-delayed
6 and phase-rotated local near signal;
7 adaptively filtering said time-delayed and phase-rotated local near signal to
8 produce a filtered signal; and
9 applying said filtered signal with said at least said representation of said
10 composite signal to yield said cancellation-processed signal.
- 1 10. The method according to claim 9 wherein said canceling step includes:
2 downconverting said first interface signal to produce said representation of
3 said first interface signal;
4 downconverting said second interface signal to produce said representation of
5 said second interface signal; and
6 upconverting said cancellation-processed signal to produce said third interface
7 signal.
- 1 11. A method for retrofitting a first device for self-interference
2 cancellation capability in two-way relayed electromagnetic communication between said first
3 device and a second device through a relay station, said first device having an existing
4 modulator unit, an existing transmitter equipment, an existing receiver equipment and an
5 existing demodulator unit, said method comprising the steps of:
6 providing a composite signal in a representation as a first interface signal from
7 said receiver equipment to a canceler module of said first device, said composite signal
8 containing a relayed version of a modulated near signal transmitted from said first device and
9 a relayed version of a modulated far signal transmitted from said second device;

10 providing a representation of said modulated near signal as a second interface
 11 signal from said modulator unit to said canceler module, said second interface signal also
 12 provided to said transmitter equipment, said second interface signal being of a frequency
 13 centered at or near a second interface frequency not at baseband;
 14 canceling at said canceler module a portion of said relayed version of said
 15 modulated near signal from said representation of said composite signal using said second
 16 interface signal to produce a cancellation-processed signal; and
 17 outputting said cancellation-processed signal as a third interface signal from
 18 said canceler module to said receiver equipment.

1 12. The method of claim 11 wherein said transmitter equipment includes
 2 an upconverter, a downconverter, or a mixer.

3 13. The method of claim 11 wherein said transmitter equipment includes
 4 an amplifier.

5 14. The method of claim 13 wherein said amplifier is a high power
 6 amplifier (HPA).

7 15. The method of claim 11 wherein said transmitter equipment includes
 8 an antenna.

9 16. The method of claim 11 wherein said transmitter equipment includes a
 2 splitter, combiner, or splitter/combiner.

1 17. The method of claim 11 wherein said receiver equipment includes an
 2 upconverter, a downconverter, or a mixer.

1 18. The method of claim 11 wherein said receiver equipment includes an
 2 amplifier.

1 19. The method of claim 18 wherein said amplifier is a low noise amplifier
 2 (LNA).

1 20. The method of claim 11 wherein said receiver equipment includes an
 2 antenna.

- 1 21. The method of claim 11 wherein said receiver equipment includes a
2 splitter, combiner, or splitter/combiner.
- 1 22. The method of claim 11 wherein said first interface signal is of a
2 frequency centered at or near a first interface frequency.
- 1 23. The method of claim of claim 22 wherein said first interface frequency
2 is an Intermediate Frequency (IF) or a Radio Frequency (RF).
- 1 24. The method of claim 11 wherein said second interface frequency is an
2 IF or RF frequency.
- 1 25. The method of claim 11 wherein said third interface signal is of a
2 frequency centered at or near a third interface frequency.
- 1 26. The method of claim of claim 25 wherein said third interface
2 frequency is an IF or RF frequency.
- 1 27. The method according to claim 11 wherein said first, second and third
2 interface signals are provided or outputted at readily accessible locations.
- 1 28. The method according to claim 11 wherein said second interface signal
2 is provided from a point in its signal path immediately preceding a signal emission stage.
- 1 29. The method according to claim 11 wherein said canceling step
2 includes:
3 applying a time delay and phase rotation to a representation of said second
4 interface signal to obtain a time-delayed and phase-rotated local near signal;
5 correlating said time-delayed and phase-rotated local near signal with at least a
6 representation of said first interface signal to obtain correction signals for said time-delayed
7 and phase-rotated local near signal;
8 adaptively filtering said time-delayed and phase-rotated local near signal to
9 produce a filtered signal; and
10 applying said filtered signal with said at least said representation of said
11 composite signal to yield said cancellation-processed signal.

1 30. The method according to claim 29 wherein said canceling step
2 includes:
3 downconverting said first interface signal to produce said representation of
4 said first interface signal;
5 downconverting said second interface signal to produce said representation of
6 said second interface signal; and
7 upconverting said cancellation-processed signal to produce said third interface
8 signal.

1 31. A method for providing self-interference cancellation in two-way
2 relayed electromagnetic communication between a first device and a second device through a
3 relay station comprising the steps of:

4 generating at said first device a modulated near signal;
5 transmitting said modulated near signal from said first device to said relay
6 station;
7 receiving at said first device a composite signal from said relay station, said
8 composite signal containing a relayed version of said modulated near signal and a relayed
9 version of a modulated far signal transmitted from said second device;
10 providing said composite signal in a representation as a first interface signal to
11 a canceler module of said first device;
12 providing a representation of said modulated near signal as a second interface
13 signal to said canceler module, said second interface signal being of a frequency centered at
14 or near a second interface frequency not at baseband;
15 canceling at said canceler module a portion of said relayed version of said
16 modulated near signal from said representation of said composite signal using said second
17 interface signal to produce a cancellation-processed signal;
18 demodulating said cancellation-processed signal to produce at least one
19 demodulated signal; and
20 outputting said at least one demodulated signal from said canceler module.

1 32. The method of claim 31 wherein said step demodulating step produces
2 more than one demodulated signal using more than one demodulator.

1 33. A system for providing self-interference cancellation in two-way
2 relayed electromagnetic communication between a first device and a second device through a
3 relay station comprising:
4 means for generating at said first device a modulated near signal;
5 means for transmitting said modulated near signal from said first device to
6 said relay station;
7 means for receiving at said first device a composite signal from said relay
8 station, said composite signal containing a relayed version of said modulated near signal and
9 a relayed version of a modulated far signal transmitted from said second device;
10 means for providing said composite signal in a representation as a first
11 interface signal to a canceler module of said first device;
12 means for providing a representation of said modulated near signal as a second
13 interface signal to said canceler module, said second interface signal being of a frequency
14 centered at or near a second interface frequency not at baseband;
15 means for canceling at said canceler module a portion of said relayed version
16 of said modulated near signal from said representation of said composite signal using said
17 second interface signal to produce a cancellation-processed signal; and
18 means for outputting said cancellation-processed signal as a third interface
19 signal from said canceler module.